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Plant species diversity and assessment in Quezon Protected Landscape, Southern Luzon, Philippines

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Abstract

Quezon Protected Landscape (QPL) is a tropical rainforest situated at the southern Sierra Madre mountain range. However, it is subjected to anthropogenic pressure that poses threats to its flora and fauna. This study was conducted to describe the plant diversity, assess their ecological and conservation status, and to identify current anthropogenic threats in various vegetation types in QPL. Vegetation assessment was done using quadrat method established at different land use types wherein ninety 10x10 m nested plots were used for trees, 5x5 m subplots were used for herbs and shrubs, and 1x1 m subplots were used for grasses. The study documented a total of 328 species belonging to 84 families and 208 genera with 2,737 individuals. Species diversity is high as revealed by the values obtained from species diversity (H') and species evenness (J') indexes. Out of 172 tree species identified, the most important species are: *Parashorea malaanonan* (Blanco) Merr. in the regenerating and lowland evergreen dipterocarp forest; *Diospyros pyrrhocarpa* Miq. in the karst forest; *Leucaena leucocephala* (Lam.) de Wit in the secondary forest; and *Cocos nucifera* L. in the agroforest. Assessment of ecological status showed that out of 328 species, 213 (64.94%) are native, wherein 65 (19.8%) are endemic, and 115 (35.06%) are introduced. Forty-five species (13.72%) are threatened in which 25 of those are endemic in the Philippines. Overall, QPL has a wide array of plant species and threats such as the illegal extraction of natural resources, encroachment, cleanliness and presence of invasive alien species. So, it is recommended that protection and awareness campaign should be done for conservation and sustainability.

Keywords: Importance Value Index, invasive species, species diversity, threatened species, vegetation analysis

Introduction

Due to its unique topography and archipelagic nature that favor geographical isolation and endemism (Persoon & Weerd, 2006; PTFCFI, 2015), the Philippines is home to thousands of both known and undocumented species of plants and animals (Medecilo & Lagat, 2017). It is one of the megadiverse countries in the world and is considered as a "biodiversity superstar" (DENR-BMB, 2014). However, it is also one of the global biodiversity hotspots (Keong, 2015; von Rintelen et al., 2017) because of adverse factors that threaten its biodiversity such as habitat loss and degradation, overexploitation and unsustainable use, invasive alien species (IAS), pollution, and climate change (DENR-BMB, 2014).

Several areas in the Philippines have undergone floral diversity assessment like the forest fragments in Cavite province (Causaren et al., 2017; Medecilo & Lagat, 2017), forest cover in Busuanga, Palawan (PCI, 2006), Mt. Maculot in Batangas (Arsenio et al., 2011), Mt. Kitanglad Range Natural Park in Bukidnon (Amoroso et al., 2011), Canbantug forest in Cebu (Replan and Malaki, 2017) and other protected areas and landscapes. However, no full accounts are available of the floral diversity of Quezon Protected Landscape (QPL) yet.

Only a few studies have been conducted at QPL including plasmodial slime molds (Dagamac et al., 2014), vertebrate mega diversity and endemism (Brown et al., 2013), analysis of forest and grassland vegetation at the southwestern side of the QPL (Tadiosa et al., 2016), and the ecological niche modelling of

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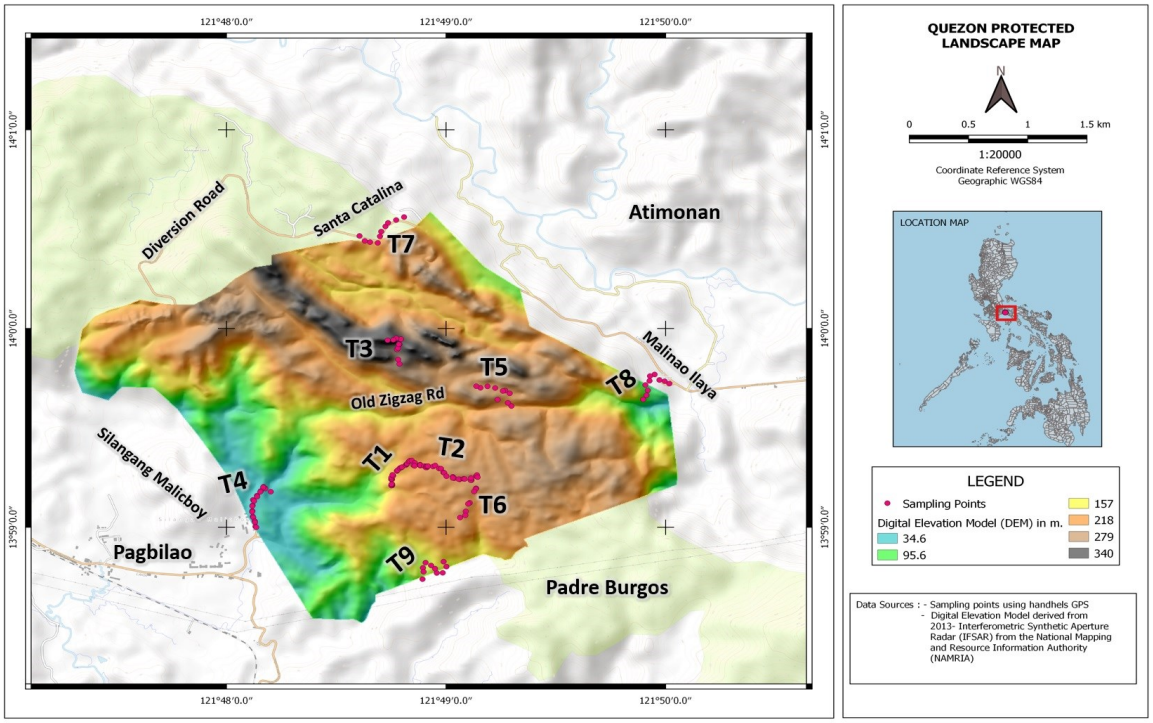

Figure 1. Geographic location of Quezon Protected Landscape showing its boundaries and 9 established transects with 90 nested plots. T1- Buenavista Spot; T2- Magnet Site; T3- Pinagbanderahan Peak; T4- Diversion Road; T5- Pinagbanderahan Foot; T6- Barangay Usli; T7- Santa Catalina; T8- Malinao Ilaya; T9- Guitong (*see* Table 1 for details).

invasive alien plant species (Paclibar & Tadiosa, 2019). However, few information on the plant species present as well as species richness and ecological status are available for the QPL. It is therefore important to conduct an inventory and assessment of the flora in the said area to generate knowledge on plant diversity and status for conservation and sustainability of the remaining biodiversity. Specifically, this study aimed to evaluate plant species composition through identification and classification of different vegetation types in the QPL; determine the conservation and taxonomic status of species of plants; and identify current threats therein. The findings can be used by the DENR-Protected Area Management Board (PAMB) of the QPL in the formulation or amendment of existing policies for the protection and conservation of plant diversity especially to the threatened plant species.

Materials and Methods

Prior Informed Consent (PIC)

To comply with E.O. 247 (Bioprospecting) and R.A. 9147 (Wildlife Resources Conservation and Protection Act), the research proposal was presented to the QPL PAMB at the Community Environmental and Natural Resources Office (CENRO) in Tayabas City, Quezon, for the approval to conduct the study and issuance of Gratuitous Permit. Permit to study was secured through PAMB Resolution 2017-04 at the DENR Regional Office in Calamba City, Laguna.

Study area

QPL is a 983.07 ha tropical rainforest (DENR Calabarzon 2013) situated between 121˚46'30" and 121˚50' 00" East and 13˚58'30" and 14˚01'00" North (Proclamation No. 394) within the southern Sierra Madre mountain range (Dagamac et al., 2014). It is situated within three municipalities of Quezon province namely Atimonan, Padre Burgos and Pagbilao (Tadiosa et al., 2016). QPL is a lowland rainforest with karst landscape and several vegetation types and is considered as "very high" priority in biodiversity conservation according to the Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau (DENR-PAWB), UP Center for Integrative and Development Studies, and Conservation International-Philippines (DENR-Calabarzon, 2013). The area has two pronounced seasons (wet and dry) with 26.9˚C average annual temperature, mean annual rainfall of 2740 mm, and 78% average humidity (Climate-Data.org, 2019).

Table 1. Description of the study site.

Site	Transect	Locality	Coordinates	Area	Elevation (masl)
1	Buenavista Spot	So. Amao, Malicboy, Pagbilao, Quezon	13º59.217'N 121º48.752'E	Lowland Evergreen Rainforest	206.22
2	Magnet Site	So. Amao, Malicboy, Pagbilao, Quezon	13º59.307'N 121º48.910'E	Regenerating Low-land Evergreen Rain-forest	241.58
3	Pinagbanderahan Peak	Malinao Ilaya, Atimonan, Quezon	13º59.822'N 121º48.788'E	Karst Forest	342.16
4	Diversion Road	Malicboy, Pagbilao, Quezon	13º59.179'N 121º48.202'E	Rural Residential, Secondary Forest	31.16
5	Pinagbanderahan Foot	Malinao Ilaya, Atimonan, Quezon	13º59.610'N 121º49.298'E	Karst Forest	249.5
6	Barangay Usli	So. Usli, Sipa, Padre Burgos,Quezon	13º59.252'N 121º49.144'E	Lowland Evergreen Rainforest	246.33
7	Santa Catalina	Sta. Catalina, Atimonan, Quezon	14º0.466'N 121º48.606'E	Secondary Forest	217.29
8	Malinao Ilaya	Malinao Ilaya, Atimonan, Quezon	13º59.723'N 121º50.017'E	Rural Residential, Secondary Forest	67.34
9	Guitong	So. Guitong, Sipa, Padre Burgos, Quezon	13º58.827'N 121º48.989'E	Agroforest	139.93

Transect establishment and plant enumeration

Nine transects were established within the QPL (Fig. 1) following some of the established transects of the DENR and additional transects were established near the buffer zone (Table 1). Buenavista Spot (T1) and Barangay Usli (T6) are both lowland evergreen dipterocarp forests which have the least disturbance among all transects. Forest is still intact with a small number of introduced plants, and dipterocarps and other native woody species are abundant. Moreover, Pinagbanderahan Peak (T3) and Pinagbanderahan Foot (T5) are both karst forests. Since the QPL is open for hiking, T3 and T5 are moderately disturbed although the trail in T5 where the transect was established was already closed. In line with this, Magnet Site (T2) which is a regenerating lowland evergreen dipterocarp forest is moderately disturbed as well since the transect is along Bitukang Manok (Old Zigzag Road) which is an alternate route going to the Bicol region. Earlier tree planting efforts were evident due to a high number of mahogany trees along the Old Zigzag Road and within T5. Guitong (T9) is an agroforest since it is a coconut plantation within the vicinity of QPL. Diversion Road (T4), Santa Catalina (T7), and the Malinao Ilaya (T8) are highly disturbed secondary forests since these are located near the national road while some parts of T4 and T8 are rural residential areas.

Quadrat method using nested plots was utilized wherein each nested plot measured 10 x 10 m for tree layer. Within the 10 x 10 plot, two sub-samplings were made: a 5 x 5 m subplot was laid for herbs and shrubs, and 1 x 1 m for grasses (Sajise & Cuevas, 1995). Each transect measured 500 m with 10 x 10 nested plots and an interval of 40 m for each plot. A total of 10 plots were laid for each 500 m transect. All trees with or above 10 cm diameter breast height (DBH) were enumerated (Amoroso et al. 2011; Medecilo & Lagat, 2017). Herbarium specimens and photographs of each plant species enumerated were collected and kept at the Biology laboratory at the Lyceum University of the Philippines (LPU Cavite). The identified plants were further verified at the Philippine National Herbarium (PNH) of the National Museum of Natural History in Manila. Plants were assessed and further classified using these references: De Guzman et al. (1986), Madulid (2000), Rojo (1997), Rojo (1999), Rojo and Aragones (1998), Cardenas et al. (2001), Ferreras et al. (2014) and Co's Digital Flora of the Philippines (Pelser et al., 2011).

Vegetation analysis

Transect survey and establishment of 90 sampling nested plots were carried out along the different sites within QPL (Fig. 1). Sites included were lowland evergreen dipterocarp forest (Fig. 2A), karst forest (Fig. 2B), mixed forest (Fig. 2C), agroforest (Fig. 2D), rural residential (Fig. 2E), grassland (Fig. 2F), and secondary forest (Fig. 2G). The ecological measures

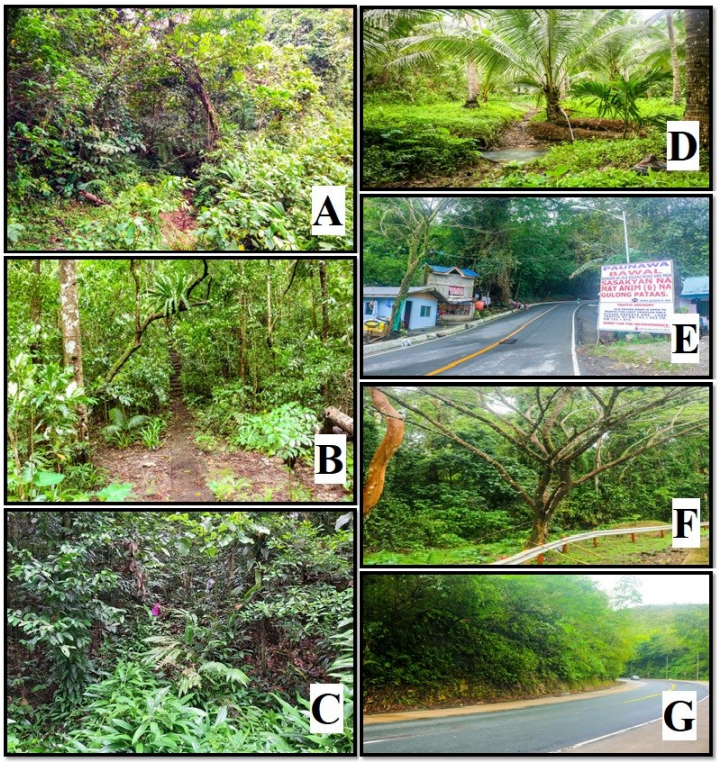

Figure 2. Area classification of the established transects. A. Lowland Evergreen Dipterocarp Forest in Pagbilao (T1) and Padre Burgos (T6); B. Karst Forest in Atimonan (T3 and T5); C. Mixed Forest in Pagbilao (T2); D. Agroforest in Padre Burgos (T9); E. Rural Residential in the Diversion Road (T4) and Malinao Ilaya (T8); F. Grassland in Pagbilao (T2); G. Secondary Forest beside the national road in Pagbilao (T4) and Atimonan (T7 and T8). See Figure 1 for the actual location.

such as species richness, species evenness, species diversity index, number of native and number of non-native plants were calculated. Species richness, number of native and non-native plants were measured through counting the species present (Borja et al., 2015). Species evenness was computed using Pielou's evenness index (Pielou, 1966) and Shannon-Wiener index was used to calculate the species diversity index (Smith and Smith, 2004). After the measurement of the DBH and its conversion to basal area, Important Value Index (IVI) was computed through the values obtained from the relative frequency, relative dominance, and relative density as prescribed by Brower and Zar (1977).

Plant identification and assessment of conservation status

The assessment of conservation status of the plants was made using references such as Fernando *et al.* (2008) and DENR AO No. 2017-11 with the following categories and definitions:

A. *Threatened Plants*
   a. Critically Endangered (CR) – refers to a species, subspecies, varieties or other categories that are showing great probability of extinction in the wild in the near future.
   b. Endangered (EN) – refers to a taxon which is not critically endangered but may face a very high risk of extinction in a medium-term future in the wild
   c. Vulnerable (VU) – refers to a taxon which is not critically endangered nor endangered but may be endangered in the near future due to adverse factors that may threaten its population

B. Other Threatened Species (OTS) – refers to a species, subspecies, varieties, or other categories (taxon) that is not critically endangered, endangered, nor vulnerable but may fall in the vulnerable category in the future due to the adverse factors that may threaten its population.

C. Other Wildlife Species (OWS) – refers to a taxon which is comprised of non-threatened species but have the tendency to become threatened in the near future and be listed in the threatened category upon the recommendation of the National Wildlife Management Committee.

Results and Discussion

Plant species diversity

A total of 2,737 plant individuals belonging to 84 families, 208 genera and 328 plant species were identified in the established transects at QPL wherein 213 were native and 115 were non-native (Table 2). Among these native plants, 148 were not endemic and 65 were endemic. The list of individuals together with their respective family, ecological status, and conservation status are presented in Table 4. Among the 84 families, the Fabaceae had the greatest number of genera and number of species with a total of 18 and 21, respectively. Among the transects established, Transect 6 (Barangay Usli) had the most number of species and species diversity was high as shown by the obtained H' index, which fell within the substantial range from 1.5 to 3.5 (Magurran, 1988), and J' index wherein the index value (observed distribution) ranged from 0.79 to 0.95 which is close to the maximum value of 1 (expected distribution) (Camargo, 1995). The most diverse among transects was Barangay Usli (T6) having the highest H' index and J' index of 3.04 and 0.95, respectively. The result could be attributed to its area classification in which high species diversity occurred with least level of disturbance (Petraitis et al., 1989). On the other hand, the least diverse among transects were Santa Catalina (T7) and diversion road (T4) having the lowest H' index (2.12) and J' index (0.81), respectively. The results

Table 2. Assessment of plant species composition, ecological structure and status. Sp. - Species; Ind. - Individual; H'-Shannon's Diversity Index; SE- Species Evenness; NE – Non-endemic; E - Endemic.

Site	Family	Genus	Sp.	Ind.	H'	SE	Native NE	E	Total Native	Non-native
1	49	85	112	339	2.57	0.85	58	31	89 (79.46%)	23 (20.54%)
2	40	68	83	295	2.18	0.79	44	16	60 (72.29%)	23 (27.71%)
3	51	73	85	278	2.2	0.83	40	14	54 (63.53%)	31 (36.47%)
4	37	65	79	276	2.13	0.81	33	8	41 (51.9%)	38 (48.1%)
5	44	76	101	348	2.87	0.93	59	22	81 (80.2%)	20 (19.8%)
6	50	86	117	376	3.04	0.95	58	30	88 (75.21%)	29 (24.79%)
7	33	46	57	251	2.12	0.87	23	9	32 (56.14%)	25 (43.86%)
8	42	66	78	257	2.28	0.89	38	9	47 (60.26%)	31 (39.74%)
9	41	68	74	317	2.58	0.88	36	16	52 (70.27%)	22 (29.73%)
Total	84	208	328	2737			148	65	213 (64.94%)	115 (35.06%)

obtained were in line with the study of Nijs et al. (2012) that found species richness was lower in highly disturbed areas compared to undisturbed areas or areas with low disturbance. Species accumulation curve (Fig. 3) showed the increase of species per plot in each sampling site. Furthermore, as the size of the sampling site increased, the number of species also increased but the occurrence of new species decreased. In accordance with Magurran (1988), the representative sampling area is reached if the increase of number of species per unit area is below 10% with an additional 10% expansion of the sampling area. As shown in the figure, the number of species started to decline when the sampling point reached 600 m^2 area. The results coincided with those of Polinar and Muuss (2010) wherein the minimum required study area was <10,000 m^2. The results suggested that the sampling points can satisfy the assessment of the diversity based on the trend shown in the graph, but additional sampling points can be added to achieve maximum decline in the addition of new species.

Vegetation types in QPL

A total of 172 tree species were recorded among the 328 plant species in the established transects. The important tree species per site and vegetation site are listed in Table 3. In the lowland evergreen rainforest, *Parashorea malaanonan* (Blanco) Merr. (Dipterocarpaceae) had the highest IVI followed by other native species such as *Diospyros pyrrhocarpa* Miq. (Ebenaceae), *Macaranga tanarius* (L.) Müll. Arg. in DC. (Euphorbiaceae), *Ficus nota* (Blanco) Merr. (Moraceae), and *Hopea malibato* Foxw. (Dipterocarpaceae). In the study of Borja *et al.* (2015), it was mentioned that *P. malaanonan* was the most abundant among dipterocarp species in their study site at Mount Makiling Forest Reserve (MMFR). Moreover, *P. malaanonan* could be found at areas where native species are abundant, and it is negatively associated with exotic coffee species. In line with this, Dipterocarpaceae species are typically known as climax species wherein they normally thrive and success rates are higher in low disturbance level (Brearly *et al.*, 2017) so one can infer from the result that the lowland evergreen rainforest in QPL has low disturbance level as exemplified by tree species that mostly belong to the Dipterocarpaceae and Ebenaceae. It is worth noting that *M. tanarius* was also one of the important tree species in the area suggesting that the lowland evergreen rainforest had disturbed parts since *M. tanarius* is usually found in areas with disturbance and can colonize gaps even in an intact forest (CABI, 2020). To add, *M. tanarius* is a highly invasive alien species in other countries (CABI, 2020). In the mixed forest or regenerating lowland evergreen rainforest, *P. malaanonan*, *M. tanarius*, and *Ficus variegata* Blume are the notable most important species. The result in the mixed forest was expected since parts of the forests were disturbed because it is near the road. In the karst forest, the most notable important tree species were *D. pyrrhocarpa* (Ebenaceae), *Pouteria macrantha* (Merr.) Baehni (Sapotaceae), *Strombosia philippinensis* (Baill.) Rolfe (Olacaceae), *Syzygium nitidum* Benth. (Myrtaceae), and *Pisonia umbellifera* (J.R. Forst. & G. Forst.) Seem. (Nyctaginaceae). Karst forest is dominated by native species that are mostly found in low disturbance area. Also, only one invasive alien species was present in the karst forest, *Triplaris cumingiana* Fisch. & Mey, suggesting that the forest was still intact since invasive alien species highly penetrated forest gaps and were favored by disturbance (Paclibar & Tadiosa, 2019). In the secondary forest, *M. tanarius*, *Swietenia macrophylla* King (Meliaceae), *Ficus ampelas* Burm.f. (Moraceae), *Leucaena leucocephala* (Lam.) de Wit (Fabaceae), *Acalypha indica* L. (Euphorbiaceae), and *Ficus septica* Burm.f (Moraceae) may be found. Secondary forests in

Table 3. Important plant species with highest Importance Value Indices (IVI) per established transect and per vegetation type.

Site	Vegetation Type	Most Important Species	IVI
1	Lowland Evergreen Rainforest	*Parashorea malaanonan* (Blanco) Merr.	9.26
		Diospyros pyrrhocarpa Miq.	8.5
		Macaranga tanarius (L.) Müll.Arg.	8.32
2	Regenerating Lowland Evergreen Dipterocarp Forest	*Parashorea malaanonan* (Blanco) Merr.	14.2
		Macaranga tanarius (L.) Müll.Arg.	8.38
		Ficus variegata Blume	8.34
3	Karst Forest	*Diospyros pyrrhocarpa* Miq.	9.99
		Pouteria macrantha (Merr.) Baehni	9.7
		Syzygium nitidum Benth.	9.21
4	Rural Residential, Secondary Forest	*Macaranga tanarius* (L.) Müll.Arg.	14.34
		Swietenia macrophylla King	14.18
		Ficus ampelas Burm.f.	10.77
5	Karst Forest	*Strombosia philippinensis* (Baill.) Rolfe	9.09
		Pouteria macrantha (Merr.) Baehni	8.55
		Pisonia umbellifera (J.R.Forst. & G.Forst.) Seem.	8.31
6	Lowland Evergreen Rainforest	*Parashorea malaanonan* (Blanco) Merr.	10.82
		Ficus nota (Blanco) Merr.	7.42
		Hopea malibato Foxw.	7.4
7	Secondary Forest	*Leucaena leucocephala* (Lam.) de Wit	18.48
		Acalypha indica L.	15.55
		Macaranga tanarius (L.) Müll.Arg.	11.1
8	Rural Residential, Secondary Forest	*Swietenia macrophylla* King	12.5
		Ficus septica Burm.f.	10.19
		Macaranga tanarius (L.) Müll.Arg.	9.48
9	Agroforest	*Cocos nucifera* L.	12.3
		Alstonia macrophylla Wall. ex G.Don	9.86
		Macaranga tanarius (L.) Müll.Arg.	9.32

QPL were highly disturbed areas mostly found along the road and near the boundary and buffer zone wherein rural residences were present. Species of the Euphorbiaceae often play a major role as dominant species especially in disturbed and severely grazed mountain parts (Pahlevani & Akhani, 2011) as demonstrated by *M. tanarius* and *A. indica* as among the most important species. *M. tanarius*, *S. macrophylla*, and *L. leucocephala* are all invasive alien species (Witt, 2017; Paclibar & Tadiosa, 2019) and these plants dominated the secondary forest signifying a threat to the native and endemic flora in QPL. Lastly, agroforest was comprised of *Cocos nucifera* L. (Arecaceae), *Alstonia macrophylla* Wall. ex G. Don (Apocynaceae), and *M. tanarius.* The result from the agroforest was also expected since it is a coconut plantation. All in all, *M. tanarius* had high IVI in all the vegetation types except in karst forest suggesting that the vegetation types in QPL were experiencing low to high disturbance level which may negatively affect the diversity of the plant species if no intervention will take place.

Assessment of conservation status

The assessment of ecological status showed that out of 328 plant species recorded, 213 (64.94%) are native, of which 65 (19.82%) of the total of plants documented are endemic, and 115 (35.06%) are introduced/nonnative species. Endemicity within the established transects in QPL ranged from 10% to 27%. A total of 20% for all the transects in QPL was acquired which was quite low compared to the substantial range of 45-60% plant endemism in the Philippines such as the results of Mittermeier *et al.* (1999). The percentage of native species ranged from 40-58% while the introduced/nonnative species ranged from 20-48% with a total of 45% and 35%, respectively.

The conservation assessment of various plant species was carried out to establish the basis for monitoring, protection, and conservation of plants at QPL. Out of the 328 plant species identified, 45 (13.72%) were listed as threatened (Table 3). Out

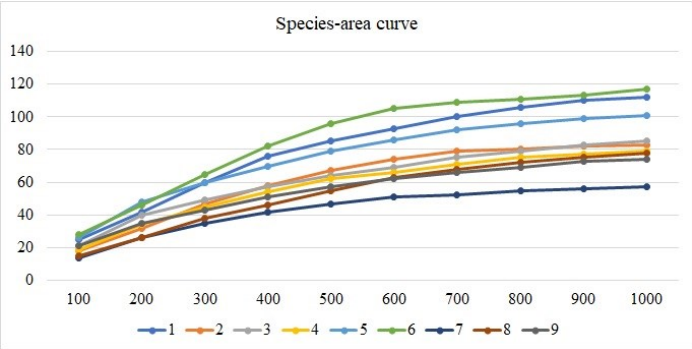

Figure 3. Species-area curve of the established transects. x-axis-square meters; y-axis – number of species; numbers correspond to various numbered sites.

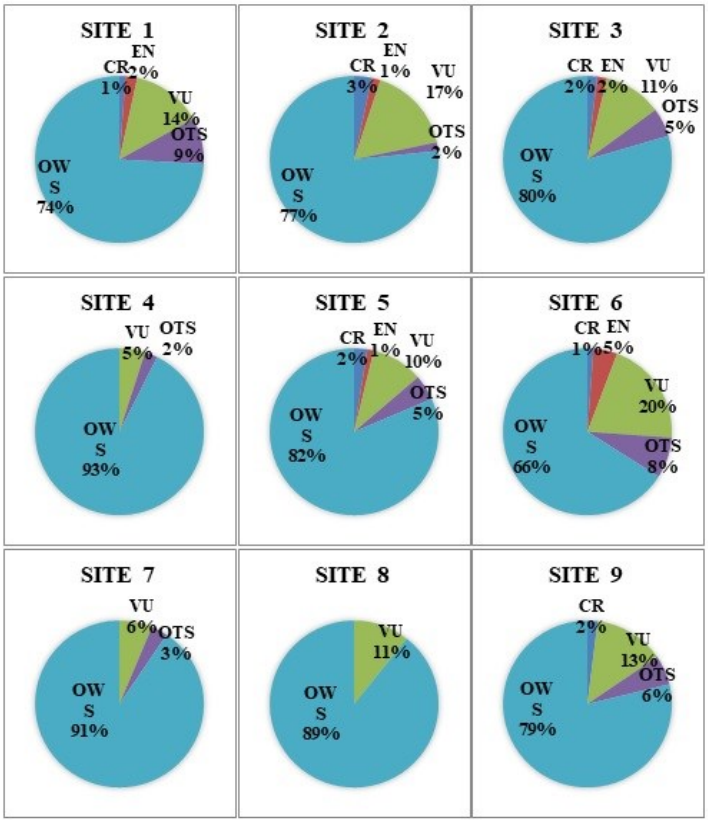

Figure 4. Assessment of conservation status of native plant species in the established transects. CR- Critically Endangered; EN- Endangered; VU- Vulnerable; OTS- Other Threatened Species; OWS- Other Wildlife Species; %- Percentage; * List based on DENR A.O. No. 2017 -11 List of Threatened Philippine Plants and their Categories. (See Table 4 for assessment per species and their respective categories).

of all the threatened species, 12 were other threatened species (OTS), 25 were vulnerable (VU), 4 were endangered (EN), and 4 were critically endangered (CR) (Table 4). The four critically endangered plant species are *Hopea malibato* Foxw. (Dipterocarpaceae), *Shorea astylosa* Foxw. (Dipterocarpaceae), *Diospyros ferrea* Kosterm. (Ebenaceae), and *D. poncei* Merr. (Ebenaceae). The Dipterocarpaceae had the highest number of threatened species among the families identified. This is in agreement with the study of Fernando *et al.* (2008) who stated that Dipterocarpaceae is one of the main families that account for majority in the list of threatened plant species in the Philippines. Since dipterocarps are the most important timber producing trees in the Philippines, it is prone to overexploitation and illegal logging leading to deforestation (Rojo, 2000). Out of 65 identified endemic species, 3 were critically endangered, 2 endangered, 13 vulnerable, and 7 were other threatened species. *S. astylosa* is a critically endangered endemic species that was identified in an agroforest where moderate disturbance was observed. Most of the threatened species were found at the lowland evergreen forest which also hosted the greatest number of endemic species. Moreover, highly disturbed areas have threatened species as well, so protection and conservation efforts should be done to limit the site's disturbance caused by anthropogenic activities.

Threats to QPL

Some threats that were identified in this study included illegal collection of natural resources, encroachment, cleanliness, and invasive alien species. The sale of seedlings of different trees was noticed near the entrance of the Old Zigzag Road wherein most of these were mahogany (Fig. 5A). There were earlier records showing people collecting the land snail "bayuko" (*Ryssota ovum* Valenciennes) or edible snails, but no new reports of collection are known (Fig. 5C). Also, encroachment was observed near the QPL boundary and buffer zone consisting of tenured and non-tenured residents (Fig. 5D). Human population could be a contributing factor for the higher number of non-native plants compared to native plants (Spear et al., 2013) which may result in low species diversity if the human settlement within the area will not be prevented. Water tapping or illegal extraction of water (Fig. 5A) for car washing business and domestic consumption at the New Diversion Road was observed (Fig. 5E). The wastewater from the car wash directly flowed to the QPL without any proper wastewater system which contributed to cleanliness problem in the area. Moreover, many travellers were littering along the road. The management was religiously maintaining the cleanliness of the QPL through their clean up drive. QPL has several roads like the New Diversion Road and the Bitukang Manok which both serve as main routes going to the Bicol region (Fig. 5B). Lembrechts et al. (2016) found that mountain roads facilitate the range dynamics of most of the non-native species in having higher ranges in elevation and broader amplitudes in roadsides. Invasive alien plant species that were present in QPL are

Table 4. Taxonomic listing of plants arranged alphabetically by family. ES – Ecological Status (N/E- Native/ Endemic; I- Nonnative or Introduced); CS- Conservation Status (CR- Critically Endangered; EN- Endangered; VU- Vulnerable; OTS- Other Threatened Species; OWS- Other Wildlife Species) based on DENR AO. No. 2017-11 List of Threatened Philippine Plant and their Categories.

Family	Scientific Name	ES	CS
Amaranthaceae	*Amaranthus spinosus* L.	I	
Anacardiaceae	*Buchanania arborescens* (Blume) Blume	N	OWS
Anacardiaceae	*Dracontomelon edule* (Blanco) Skeels	N	OWS
Anacardiaceae	*Koordersiodendron pinnatum* (Blanco) Merr.	N	OTS
Anacardiaceae	*Mangifera altissima* Blanco	N	VU
Anacardiaceae	*Mangifera indica* L.	I	
Anacardiaceae	*Semecarpus cuneiformis* Blanco	N	OWS
Anacardiaceae	*Semecarpus longifolius* Blume	N	OWS
Anacardiaceae	*Semecarpus sp.*	N	OWS
Annonaceae	*Annona muricata* L.	I	
Annonaceae	*Cananga odorata* (Lam.) Hook.f. & Thomson	N	OWS
Annonaceae	*Goniothalamus elmeri* Merr.	N/E	OWS
Annonaceae	*Mitrephora lanotan* (Blanco) Merr.	N/E	OTS
Annonaceae	*Uvaria rufa* (Dunal) Blume	I	
Apiaceae	*Centella asiatica* (L.) Urban	I	
Apocynaceae	*Alstonia macrophylla* Wall. ex G.Don	N	OWS
Apocynaceae	*Alstonia scholaris* (L.) R.Br.	N/E	OWS
Apocynaceae	*Tabernaemontana pandacaqui* Poir.	N	OWS
Apocynaceae	*Urceola laevigata* (Juss.) D.J.Middleton & Livsh	N	OWS
Apocynaceae	*Voacanga globosa* (Blanco) Merr.	N/E	OWS
Araceae	*Alocasia heterophylla* (C.Presl) Merr.	N/E	OWS
Araceae	*Alocasia macrorrhizos* L.	N	OWS
Araceae	*Alocasia sp.*	I	
Araceae	*Amorphophallus campanulatus* Blume ex Decne.	I	
Araceae	*Caladium sp.*	N	OWS
Araceae	*Colocasia esculenta* (L.) Schott in Schott & Endl.	N	OWS
Araceae	*Epipremnum pinnatum* (L.) Engl.	N	OWS
Araceae	*Homalomena philippinensis* Engl. ex Engl. & K.Krause	N/E	OWS
Araceae	*Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi	I	
Araceae	*Xanthosoma sagittifolium* (L.) Schott	I	
Araliaceae	*Polyscias nodosa* (Blume) Seem.	N/E	OWS
Arecaceae	*Areca catechu* L.	N/E	OWS
Arecaceae	*Arenga pinnata* (Wurmb.) Merr.	N	OWS
Arecaceae	*Calamus merrillii* Becc.	N/E	OTS
Arecaceae	*Calamus mindorensis* Becc.	N/E	OWS
Arecaceae	*Calamus ornatus* Blume	N	OTS
Arecaceae	*Calamus ramulosus* Becc.	N	OWS
Arecaceae	*Calamus* sp.	N	OWS

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Arecaceae	*Calamus* sp.	N	OWS
Arecaceae	*Calamus curanii* (Becc.) W.J.Baker	N/E	VU
Arecaceae	*Calamus* sp.	N	OWS
Arecaceae	*Caryota cumingii* Lodd. ex C.Mart.	N/E	OWS
Arecaceae	*Caryota rumphiana* Mart.	N/E	OWS
Arecaceae	*Caryota* sp.	N	OWS
Arecaceae	*Cocos nucifera* L.	I	
Arecaceae	*Daemonorops mollis* (Blanco) Merr.	N/E	OTS
Arecaceae	*Livistona rotundifolia* (Lam.) Mart.	N	OTS
Arecaceae	*Oncosperma tigillarium (*Jack) Ridl.	N	VU
Asparagaceae	*Sanseviera trifasciata* Prain	I	
Aspleniaceae	*Asplenium macrophyllum* Sw.	N	OWS
Aspleniaceae	*Asplenium nidus* L.	N	OWS
Aspleniaceae	*Asplenium* sp.	N	OWS
Asteraceae	*Chromolaena odorata* (L.) R.M.King & H.Rob.	I	
Asteraceae	*Ageratum conyzoides* L.	I	
Asteraceae	*Blumea balsamifera* (L.) DC.	I	
Asteraceae	*Elephantopus tomentosus* L.	I	
Asteraceae	*Mikania cordata* (Burm.f.) B.L.Rob.	I	
Asteraceae	*Vernonia arborea* Welw. ex O.Hoffm.	I	
Asteraceae	*Vernonia vidalii* Merr.	N	OWS
Athyriaceae	*Diplazium esculentum* (Retz.) Sw.	I	
Begoniaceae	*Begonia copelandii* Merr.	N/E	OWS
Bignoniaceae	*Dolichandrone spathacea* (L.f.) K.Schum.	I	
Bignoniaceae	*Radermachera pinnata* (Blanco) Seem.	N	OWS
Burseraceae	*Canarium asperum* Benth.	N/E	OWS
Burseraceae	*Canarium hirsutum* Willd.	N	OWS
Burseraceae	*Canarium ovatum* Engl.	N/E	OTS
Burseraceae	*Canarium* sp.	N	OWS
Calophyllaceae	*Calophyllum blancoi* Planch. & Triana	N/E	OWS
Calophyllaceae	*Calophyllum inophyllum* L.	N	OWS
Cannabaceae	*Celtis luzonica* Warb.	N/E	OWS
Cannabaceae	*Celtis* sp.	N	OWS
Capparaceae	*Cleome spinosa* Jacq.	I	
Cardiopteridaceae	*Gonocaryum calleryana* Baill.	I	
Caricaceae	*Carica papaya* L.	I	
Casuarinaceae	*Gymnostoma rumphianum* (Jungh. ex de Vriese) L.A.S. Johnson	N	OWS
Casuarinaceae	*Gymnostoma sp.*	I	
Casuarinaceae	*Gymnostoma sumatranum* (Jungh. ex de Vriese) L.A.S. Johnson	I	
Combretaceae	*Terminalia citrina* (Gaertn.) Roxb. ex Flem	N	OWS

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Combretaceae	*Terminalia foetidissima* Griff.	N	OWS
Combretaceae	*Terminalia microcarpa* Decne.	N	OWS
Commelinaceae	*Commelina benghalensis* L.	I	
Commelinaceae	*Zebrina pendula* Schnizl.	I	
Convolvulaceae	*Ipomoea batatas* (L.) Poir	I	
Cornaceae	*Alangium javanicum* (Blume) Wangerin in Engl. & Prantl.	I	
Cucurbitaceae	*Gynostemma pentaphyllum* (Thunb.) Makino	I	
Cucurbitaceae	*Melothria pendula* L.	I	
Cucurbitaceae	*Trichosanthes bracteata* (Lam.) Voigt	I	
Cyatheaceae	*Cyathea contaminans* (Wall. ex Hook.) Copel.	N	OWS
Cyperaceae	*Cyperus kyllingia* Endl.	I	
Cyperaceae	*Fimbristylis globulosa* (Retz.) Kunth	I	
Cyperaceae	*Scleria scrobiculata* Nees & Meyen	I	
Dilleniaceae	*Dillenia luzonensis* (S.Vidal) Merr.	N/E	VU
Dilleniaceae	*Dillenia philippinensis* Rolfe	N/E	OWS
Dilleniaceae	*Tetracera scandens* (L.) Merr.	N	OWS
Dilleniaceae	*Tetracera* sp.	N	OWS
Dipterocarpaceae	*Anisoptera thurifera* (Blanco) Blume	N	OWS
Dipterocarpaceae	*Dipterocarpus grandiflorus* (Blanco) Blanco	N	VU
Dipterocarpaceae	*Dipterocarpus hasseltii* Blume	N	VU
Dipterocarpaceae	*Dipterocarpus kerrii* King	N	OWS
Dipterocarpaceae	*Hopea acuminata* Merr.	N/E	EN
Dipterocarpaceae	*Hopea malibato* Foxw.	N/E	CR
Dipterocarpaceae	*Parashorea malaanonan* (Blanco) Merr.	N	OWS
Dipterocarpaceae	*Shorea astylosa* Foxw.	N/E	CR
Dipterocarpaceae	*Shorea contorta* S.Vidal	N/E	VU
Dipterocarpaceae	*Shorea falciferoides* Foxw.	N/E	VU
Dipterocarpaceae	*Shorea guiso* (Blanco) Blume	N	OWS
Dipterocarpaceae	*Shorea palosapis* (Blanco) Merr.	N/E	OWS
Dipterocarpaceae	*Shorea polysperma* (Blanco) Merr.	N/E	VU
Dipterocarpaceae	*Vatica mangachapoi* Blanco	N	VU
Ebenaceae	*Diospyros blancoi* A.DC.	N	VU
Ebenaceae	*Diospyros cauliflora* Blume	N	VU
Ebenaceae	*Diospyros curannii* Merr.	N	OTS
Ebenaceae	*Diospyros ferrea* (Willd.) Bakh.	N	CR
Ebenaceae	*Diospyros pilosanthera* Blanco	N/E	VU
Ebenaceae	*Diospyros poncei* Merr.	N/E	CR
Ebenaceae	*Diospyros pyrrhocarpa* Miq.	N/E	VU
Ebenaceae	*Diospyros* sp.	N	OWS
Euphorbiaceae	*Acalypha indica* L.	I	

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Euphorbiaceae	*Acalypha* sp.	I	
Euphorbiaceae	*Croton tiglium* L.	I	
Euphorbiaceae	*Endospermum peltatum* Merr.	I	
Euphorbiaceae	*Euphorbia hirta* L.	I	
Euphorbiaceae	*Macaranga bicolor* Müll.Arg.	N/E	OWS
Euphorbiaceae	*Macaranga* sp.	N	OWS
Euphorbiaceae	*Macaranga tanarius* (L.) Müll.Arg.	N	OWS
Euphorbiaceae	*Manihot esculenta* Crantz	I	
Fabaceae	*Abrus precatorius* L.	N	OWS
Fabaceae	*Adenanthera intermedia* Merr.	N/E	OWS
Fabaceae	*Afzelia rhomboidea* (Blanco) S.Vidal	N	EN
Fabaceae	*Albizia acle* (Blanco) Merr.	N	OWS
Fabaceae	*Albizia falcataria* (L.) Fosb.	I	
Fabaceae	*Bauhinia cumingiana* (Benth.) Fern.	N	OWS
Fabaceae	*Caesalpinia pulcherrima* (L.) Sw.	I	
Fabaceae	*Calopogonium mucunoides* Desv.	I	
Fabaceae	*Centrosema pubescens* auct. non Benth.	I	
Fabaceae	*Cynometra ramiflora* L.	N	OWS
Fabaceae	*Cynometra simplicifolia* Harms	I	
Fabaceae	*Derris elliptica* (Wall.) Benth.	I	
Fabaceae	*Desmodium heterocarpon* (L.) DC.	I	
Fabaceae	*Enterolobium cyclocarpum* (Jacq.) Griseb.	I	
Fabaceae	*Erythrina orientalis* L.	N	OWS
Fabaceae	*Erythrina subumbrans* (Hassk.) Merr.	I	
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit	I	
Fabaceae	*Mimosa pudica* L.	I	
Fabaceae	*Ormosia calavensis* Azaola ex Blanco	N	OWS
Fabaceae	*Pterocarpus indicus* Willd.	N	VU
Fabaceae	*Albizia saman* (Jacq.) F.Muell	I	
Fagaceae	*Castanea mollissima* Blume	I	
Fagaceae	*Lithocarpus ovalis* (Blanco) Rehder	I	
Flagellariaceae	*Flagellaria indica* L.	I	
Gesneriaceae	*Epithema* sp.	I	
Gleicheniaceae	*Dicranopteris* sp.	N	OWS
Gnetaceae	*Gnetum gnemon* L.	N	OWS
Hypericaceae	*Cratoxylum blancoi* Blume	N/E	OWS
Hypericaceae	*Cratoxylon* sp.	N	OWS
Hypericaceae	*Cratoxylum blancoi* Blume	N	OWS
Hypericaceae	*Cratoxylum* sp.	N	OWS
Lamiaceae	*Clerodendrum intermedium* Cham.	N	OWS

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Lamiaceae	*Clerodendrum quadriloculare* (Blanco) Merr.	N	VU
Lamiaceae	*Hyptis* sp.	N	OWS
Lamiaceae	*Teijsmanniodendron ahernianum* (Merr.) Bakh.	N	OWS
Lauraceae	*Cinnamomum celebicum* Miq.	I	
Lauraceae	*Cinnamomum mercadoi* S.Vidal	N/E	OTS
Lauraceae	*Cinnamomum* sp.	N	OWS
Lauraceae	*Cinnamomum zeylanicum* Blume	N	OWS
Lauraceae	*Litsea leytensis* Merr.	N/E	EN
Lauraceae	*Litsea* sp.	N	OWS
Lauraceae	*Neolitsea zeylanica* (Nees) Merr.	I	
Lauraceae	*Persea americana* Mill.	I	
Lauraceae	*Persea philippinensis* (Merr.) Elmer	N/E	OTS
Lygodiaceae	*Lygodium circinnatum* (Burm.f.) Sw.	I	
Lythraceae	*Lagerstroemia speciosa* (L.) Pers.	N	
Malvaceae	*Ceiba pentandra* (L.) Gaertn.	I	
Malvaceae	*Colona serratifolia* Cav.	N	OWS
Malvaceae	*Diplodiscus paniculatus* Turcz.	N/E	OWS
Malvaceae	*Grewia multiflora* Juss.	N	OWS
Malvaceae	*Grewia* sp.	N	OWS
Malvaceae	*Microcos* sp.	N	OWS
Malvaceae	*Microcos stylocarpa* (Warb.) Burret	N	OWS
Malvaceae	*Pterocymbium tinctorium* (Blanco) Merr.	N	OWS
Malvaceae	*Pterospermum diversifolium* Blume	N	OWS
Malvaceae	*Pterospermum niveum* S.Vidal	N	OWS
Malvaceae	*Pterospermum obliquum* Blanco	N/E	OWS
Malvaceae	*Sterculia oblongata* R.Br. in Benn.	I	
Malvaceae	*Sterculia philippinensis* Merr.	N/E	OWS
Malvaceae	*Sterculia* sp.	N	OWS
Malvaceae	*Urena lobata* L.	I	
Marantaceae	*Donax canaeformis* (G.Forst.) K.Schum.	I	
Marantaceae	*Phacelophrynium interruptum* Warb. ex K.Schum.	N	OWS
Marattiaceae	*Angiopteris evecta* Sw.	N	OWS
Marattiaceae	*Angiopteris* sp.	I	
Marsileaceae	*Marsilea minuta* L.	I	
Meliaceae	*Aglaia edulis* (Roxb.) Wall.	N	OTS
Meliaceae	*Aglaia pachyphylla* Miq.	N	OWS
Meliaceae	*Chisocheton pentandrus* (Blanco) Merr.	N	OWS
Meliaceae	*Dysoxylum arborescens* (Blume) Miq.	N	OWS
Meliaceae	*Dysoxylum gaudichaudianum* (A.Juss.) Miq.	N	OWS
Meliaceae	*Lansium domesticum* Correa	I	

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Meliaceae	*Sandoricum koetjape* (Burm.f.) Merr.	I	
Meliaceae	*Swietenia macrophylla* King	I	
Meliaceae	*Toona calantas* Merr. & Rolfe	N	VU
Menispermaceae	*Anamirta cocculus* (L.) Wight & Arn.	N	OWS
Moraceae	*Artocarpus odoratissimus* Blanco	N	OWS
Moraceae	*Artocarpus altilis* (Park.) Fosb.	N	OWS
Moraceae	*Artocarpus blancoi* (Elmer) Merr.	N/E	OWS
Moraceae	*Artocarpus heterophyllus* Lam.	I	
Moraceae	*Artocarpus nitidus* (Merr.) F.M. Jarrett	N	OWS
Moraceae	*Ficus ampelas* Burm.f.	N	OWS
Moraceae	*Ficus balete* Merr.	N/E	OWS
Moraceae	*Ficus fistulosa* Reinw. ex Blume	N	OWS
Moraceae	*Ficus nota* (Blanco) Merr.	N	OWS
Moraceae	*Ficus pseudopalma* Blanco	N/E	OWS
Moraceae	*Ficus septica* Burm.f.	N	OWS
Moraceae	*Ficus* sp.	N	OWS
Moraceae	*Ficus* sp.	N	OWS
Moraceae	*Ficus variegata* Blume	N	OWS
Moraceae	*Parartocarpus* sp.	N	OWS
Muntingiaceae	*Muntingia calabura* L.	I	
Musaceae	*Musa x sapientum* L.	I	
Musaceae	*Musa sapientum* L. *var. cinerea* (Blanco) Teodoro	I	
Musaceae	*Musa* sp.	I	
Musaceae	*Musa* sp.	I	
Myristicaceae	*Knema glomerata* (Blanco) Merr.	N/E	OWS
Myristicaceae	*Myristica elliptica* Wall. ex Hook.f.	N	OWS
Myristicaceae	*Myristica philippensis* Lam.	N/E	OTS
Myrsinaceae	*Ardisia* sp.	I	
Myrtaceae	*Eugenia uniflora* L.	N	OWS
Myrtaceae	*Psidium guajava* L.	I	
Myrtaceae	*Syzygium crassipes* (C.B.Rob.) Merr.	N/E	OWS
Myrtaceae	*Syzygium longiflorum* C.Presl	N	OWS
Myrtaceae	*Syzygium nitidum* Benth.	N	VU
Myrtaceae	*Syzygium polycephaloides* (C.B.Rob.) Merr.	N	OWS
Myrtaceae	*Syzygium* sp.	N	OWS
Myrtaceae	*Syzygium* sp.	I	
Myrtaceae	*Tristanopsis decorticata* (Merr.) PeterG.Wilson & J.T.Waterh.	N/E	VU
Nephrolepidaceae	*Nephrolepis exaltata* W.H. Wagner	I	
Nephrolepidaceae	*Nephrolepis* sp.	I	
Nyctaginaceae	*Pisonia umbellifera* (J.R.Forst. & G.Forst.) Seem.	N	OWS

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Olacaceae	*Strombosia philippinensis* (Baill.) Rolfe	N/E	OWS
Oleaceae	*Jasminum sambac* (L.) Aiton	N	OWS
Oleaceae	*Linociera ramiflora* (Roxb.) Wall.	I	
Onagraceae	*Ludwigia* sp.	I	
Pandanaceae	*Pandanus luzonensis* Merr.	N/E	OWS
Passifloraceae	*Passiflora foetida* L.	I	
Phyllanthaceae	*Antidesma* sp.	N	OWS
Phyllanthaceae	*Breynia cernua* (Poir.) Müll.Arg.	N	OWS
Phyllanthaceae	*Glochidion philippicum* (Cav.) C.B.Rob.	N	OWS
Phyllanthaceae	*Glochidion* sp.	N	OWS
Phyllanthaceae	*Phyllanthus buxifolius* (Blume) Müll.Arg.	N	OWS
Phyllanthaceae	*Phyllanthus niruri* auct. non L.	I	
Phyllanthaceae	*Phyllanthus* sp.	N	OWS
Piperaceae	*Peperomia microphylla* Dahlst.	I	
Piperaceae	*Peperomia pellucida* (L.) Kunth	I	
Piperaceae	*Piper betle* L.	N	OWS
Poaceae	*Axonopus compressus* (Sw.) P.Beauv.	N	OWS
Poaceae	*Bambusa multiplex* (Lour.) Raeusch.	I	
Poaceae	*Chrysopogon aciculatus* (Retz.) Trin.	I	
Poaceae	*Coix lacryma-jobi* L.	I	
Poaceae	*Dinochloa scandens* (Blume ex Nees) Kuntze	N	OWS
Poaceae	*Eleusine indica* (L.) Gaertn.	I	
Poaceae	*Imperata cylindrica* (L.) P.Beauv.	N	OWS
Poaceae	*Panicum maximum* Jacq.	I	
Poaceae	*Panicum* sp.	I	
Poaceae	*Paspalum conjugatum* P.J.Bergius	I	
Poaceae	*Paspalum distichum* auct. non L.	I	
Poaceae	*Saccharum spontaneum* L.	I	
Podocarpaceae	*Podocarpus polystachyus* R.Br. ex Endl.	I	
Polygonaceae	*Triplaris cumingiana* Fisch. & C.A.Mey. ex C.A.Mey.	I	
Pteridaceae	*Adiantum pedatum* L.	N	OWS
Pteridaceae	*Adiantum* sp.	I	
Pteridaceae	*Pteris* sp.	I	
Putranjivaceae	*Drypetes longifolia* (Blume) Pax & Hoffm.	N	OWS
Rosaceae	*Prunus grisea* (Blume) Kalkm.	N	OWS
Rubiaceae	*Antherostele* sp.	N	OWS
Rubiaceae	*Canthium horridum* Blume	I	
Rubiaceae	*Coffea robusta* L.Linden	I	
Rubiaceae	*Coffea canephora* Pierre ex A.Froehner	I	
Rubiaceae	*Nauclea orientalis* (L.) L.	N	OWS

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Rubiaceae	*Nauclea sp.*	N	OWS
Rubiaceae	*Neonauclea calycina* (Bartl. ex DC.) Merr.	N	OWS
Rubiaceae	*Psychotria elliptifolia* Elmer	N/E	OWS
Rubiaceae	*Psychotria manillensis* Bartl. ex DC.	N/E	OWS
Rubiaceae	*Psychotria membranifolia* Merr.	N	OWS
Rubiaceae	*Psychotria microphylla* Elmer	N/E	OWS
Rubiaceae	*Psychotria ovalis* Elmer	N/E	OWS
Rubiaceae	*Psychotria pauciflora* Bartl. ex DC.	N/E	OWS
Rubiaceae	*Psychotria rubiginosa* Elmer	N/E	OWS
Rubiaceae	*Psychotria* sp.	N	OWS
Rutaceae	*Citrus grandis* Osbeck	I	
Rutaceae	*Citrus reticulata* Blanco	I	
Rutaceae	*Citrus* sp.	I	
Rutaceae	*Lunasia amara* Blanco	I	
Rutaceae	*Zanthoxylum limonella* (Dennst.) Alston	I	
Salicaceae	*Homalium bracteatum* Benth.	N/E	OWS
Sapindaceae	*Dimocarpus longan* Lour.	I	
Sapindaceae	*Ganophyllum falcatum* Blume	N	OWS
Sapindaceae	*Guioa discolor* Radlk.	N/E	VU
Sapindaceae	*Guioa koelreuteria* (Blanco) Merr.	N	OWS
Sapindaceae	*Litchi chinensis Sonn.* spp. *philippinensis* (Radlk.) Leenh.	N/E	VU
Sapindaceae	*Nephelium lappaceum* L.	N	VU
Sapindaceae	*Nephelium ramboutan-ake* (Labill.) Leenh.	N	OWS
Sapotaceae	*Ganua obovatifolia* (Merr.) Assem	N	OWS
Sapotaceae	*Madhuca obovatifolia* (Merr.) Merr.	N/E	EN
Sapotaceae	*Mimusops elengi* L.	N	OWS
Sapotaceae	*Palaquium barnesii* auct. non Merr.	N/E	OWS
Sapotaceae	*Palaquium formosanum* Hayata	I	
Sapotaceae	*Palaquium lanceolatum* Blanco	N/E	OWS
Sapotaceae	*Palaquium philippinense* H.J.Lam	N/E	VU
Sapotaceae	*Planchonella villamilii* (Merr.) Swenson	N/E	VU
Sapotaceae	*Pouteria macrantha* (Merr.) Baehni	N	OWS
Selaginellaceae	*Selaginella cumingiana* Spring	N	OWS
Selaginellaceae	*Selaginella cupressina* (Willd.) Spring	N	OWS
Solanaceae	*Capsicum frutescens* L.	I	
Solanaceae	*Solanum biflorum* Lour.	I	
Solanaceae	*Solanum cumingii* Dunal in DC.	N	OWS
Stemonuraceae	*Gomphandra cumingiana* (Miers) Fern.	N	OWS
Tetramelaceae	*Octomeles sumatrana* Miq.	N	OWS
Urticaceae	*Dendrocnide meyeniana* (Walp.) Chew	N	OWS

Cont'd Table 4. Taxonomic listing of plants arranged alphabetically by family.

Family	Scientific Name	ES	CS
Urticaceae	*Elatostema elmeri* Merr.	N/E	OWS
Urticaceae	*Pipturus arborescens* (Link) C.B.Rob.	I	
Verbenaceae	*Lantana camara* L.	I	
Verbenaceae	*Stachytarpheta jamaicensis* (L.) Vahl	I	
Vitaceae	*Leea aculeata* Blume ex Sprengel	N	OWS
Vitaceae	*Leea sp.*	N	OWS
Zingiberaceae	*Alpinia foxworthyi* Ridl.	N/E	VU
Zingiberaceae	*Alpinia haenkei* C.Presl	N	OWS
Zingiberaceae	*Alpinia pubiflora* (Benth.) K.Schum.	N	OWS
Zingiberaceae	*Alpinia zerumbet* (Pers.) B.L.Burtt & R.M.Sm.	I	

Figure 5. Threats encountered at QPL while conducting the study. A. Mahogany saplings; B. Main roads going to Bicol region; C. Gathering of "bayuko"; D. Rural residentials inside the QPL; E. Carwashing business inside the QPL.

Ageratum conyzoides L., *Calopogonium mucunoides* Desv., *Chromolaena odorata* L., *Lantana camara* L., *Leucaena leucocephala* (Lam.) de Wit, *Melothria pendula* L., *Mikania cordata* (Burm.f.) B.L. Rob., *Mimosa pudica* L., *Stachytarpheta jamaicensis* (L.) Vahl., and *Triplaris cumingiana* Fisch. & Mey. (Paclibar & Tadiosa, 2019).

All observed threats were not imminently bad because efforts of the LGU and the protected area superintendent (PASu) are in place in mitigating such problems through several programs and projects which promote sustainability and conservation efforts. Notwithstanding, encroachment can be considered most serious because human activities are directly involved in all of the disturbances seen in the area especially in the collection and extraction of natural resources as well as the cleanliness.

Recommendations for QPL

Since the threats are mostly from anthropogenic activities and invasive alien species, it is highly recommended that protection and awareness campaigns should be done. Protection can be achieved through surveillance, patrolling, and close monitoring of the areas especially in the lowland evergreen rainforest and karst forest. For the secondary forests, rehabilitation should be prioritized to avoid forest simplification and to prevent the non-native species from outcompeting the native plants. In line with this, joint efforts coming from the LGUs, PAMB and stakeholders for awareness campaign are a must to educate the residents staying adjacent to QPL.

Conclusion and Recommendations

QPL has a wide array of plant species. It consists of 328 plant species belonging to 84 families and 208 genera. Among the 172 tree species identified, *Parashorea malaanonan* is deemed to be the most important in lowland evergreen rainforest and in mixed or emerging lowland evergreen rainforest; *Diospyros pyrrhocarpa* in the karst forest; *Leucaena*

leucocephala in the secondary forest; and *Cocos nucifera* in the agroforest. Of the different vegetation types, *Macaranga tanarius* is one of the most important species except in the karst forest which also suggests disturbance to the area. There are 65 endemic out of 213 native plants implying that endemicity is quite low (19.82%). Out of 45 threatened species recorded, 25 are endemic. Threats encountered include illegal collection of natural resources, encroachment, cleanliness, and presence of invasive alien species, despite the efforts of the LGU and the PASu in the mitigation of such problems through several programs and projects which promote sustainability and conservation.

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